

his

SS 1: RECONSTRUCT: (F) REDUNDAN: (F) ACCESS: (9)
SS 2: RECONSTRUCT: (F) ACCESS: (267)
SS 3: RECONSTRUCT: OR (RE (1N) CONSTRUCT:) (8545)
SS 4: ((TIME (5N) ZONE#) OR (TIME (5N) SLOT#)) (9720)
SS 5: 3 (F) 4 (33)
SS 6: 1 OR 2 (267)
SS 7: 5 AND NOT 6 (27)

SS 8?

---Logging off of Orbit---

☐

08/895,886

?

☐logoff y

SESSION FINISHED 02/15/99 10:57 A.M. (CENTRAL TIME)
ELAPSED TIME ON WPAT: 0.71 HRS.
ELAPSED TIME THIS SESSION: 0.72 HRS.
ORBIT SEARCH SESSION COMPLETED. THANKS FOR USING ORBIT!

08/834,841 → 5,889,938 (not available yet):
07/859,850 → 5,495,572

-4- (WPAT)

TI - Data reconstruction method after failure for access or read-write in parallel with independent storage units - detects failure using error check, discriminates failure selects processing for failure from normal access or read-write

PN - US5495572 A 96.02.27 *

AB - US5495572 A

The storage data reconstruction system includes storage units for storing

divided data units for storing ECC data corresponding to the divided data. A spare storage unit for storing reconstructed data. An I-O-reconstruction control circuit, a timer, a data reconstructing table for a storage unit which has failed and a circuit for reconstructing faulty data are provided.

When a failure occurs in any of the storage units, the failure is detected by an error check, a state of the failure is discriminated, a preferred processing suitable for the state of the failure is selected from a processing of a normal access or read-write, and a data reconstruction processing, and the selected processing is carried out,

or

the frequency of the processing of the normal access or read-write and the data reconstruction processing, or the ratio of the amount of the data reconstruction processing within a unit time, is set. The time

taken

to reconstruct the faulty data does not exceed a fixed period of time.

ADVANTAGE - Minimises reduction of processing of normal access or read-write in failure, limits time required for repair of failure within fixed time and ensures high reliability, w.r.t. memory which has redundancy for failure of two or more storage. (Dwg.2/9)

3- (WPAT)

TI - On-line reconstruction method for failed disks in redundant array -
reconstructing blocks on-the-fly including concurrent reads and read
elements of concurrent read-modify-write requests

PN - EP-831400 A2 98.03.25 *

AB - EP-831400 A

The computer system has a redundant disk array using a format that
stores

blocks and error correcting blocks on different disks. When one of the
disks fails, it is replaced, manually or automatically by another
disk. This disk then has to be reconstructed to hold the original data.

When the disk is available, a sequential process is started to
read

blocks from other disks and recreate the block for the new disk. During
this process, reads and writes may be received from elsewhere in the
system. All reads are processed by a concurrent task that reconstructs
on-the-fly. This includes the read part of a read-modify-write access.

ADVANTAGE - Provides logically simple procedure for reconstructing
disk while retaining concurrent system operation. (Dwg.3/5)

-44- (WPAT)

TI - Method of detecting and correcting errors in mass storage system - involves reconstructing corrected data slice from one data strip and one parity slice, corrected data slice replaces one erroneous data slice

PN - US5649093 A 97.07.15 *

AB - US5649093 A

The method involves retrieving one the data strip from sad cluster of data drives. a data drive failure affecting an erroneous one of aid data slices of the one data strip is detected. One of the parity slices corresponding to the one data strip is retrieved from the parity drive.

A

corrected data slice is reconstructed from the one data strip and the

one

parity slice.

The corrected data slice replaces the one erroneous data slice.

The

data slices of the one data strip have been distributed among different zones of the data drives so that the average retrieval rate of the data slices approximates the access rate associated with intermediate, zone

of

the data drives.

ADVANTAGE - Capable of delivering time critical data and real time reconstruction of erroneous data without need to substantial increase in process

-100- (WPAT)

TI - Data word recovery method for digital data system - applies reconstruction function to copies of encoded data word to produce reconstructed encoded data word.

PN - WO9318589 A1 93.09.16 *

PN - GB2271451 A 94.04.13

PN - DE4391075 T 94.04.28

PN - US5321703 A 94.06.14

PN - GB2271451 B 96.02.14

AB - WO9318589 A

The method involves encoding the data word according to an error-correcting code to produce an encoded data word. A number of possibly error-corrupted copies (20) of the encoded data word are generated.

A reconstruction function is applied to the copies of the encoded data word to produce a reconstructed encoded data word (22). The reconstructed encoded data word is decoded according to the error-correcting code. A commonly-used type of code in data storage systems is the class of Reed-Solomon codes, which are special forms of 'BCH codes'.

ADVANTAGE - Enhances error correction capability in digital data systems and allows recovery of data from a sequence of possibly error-corrupted instances or copies of encoded data word created from

the

data according to error-correction code. Has greater data integrity as data may be recovered during final decoding step despite failure to decode each tape individually. (Dwg.2/3)

64- (WPAT)

TI - Disk replacement method in data storage system - by systematically reconstructing data or parity blocks with associated status bits in first

state and after each reconstruction setting associated status bit to second state

PN - US5522031 A 96.05.28 *

AB - US5522031 A

The method involves detecting a failed disk in an array. The failed disk is removed from the array. A new disk is prepared by setting all status bits to a first state. The new disk added to the array. Data or parity blocks are systematically reconstructed with associated status bits in the first state. After each reconstruction of a data block or parity block, the associated status bit are set to a second state.

The systematic reconstruction is continued until all blocks on the new disk have been reconstructed. Requests to access data blocks in the new disk are received from a user application. Data are written to the accessed data blocks in the new disk and the associated status bits are set to the second state.

ADVANTAGE - Allows on-line restoration of replacement disk to RAID array while allowing high performance concurrent application access to array.

-5- (WPAT)

TI - Dynamic expansion for RAID storage system - has storage increased by as little as one unit and rearrangement function that re-organises storage while continuing to handle processor requests

PN - EP-654736 A2 95.05.24 *

PN - US5564116 A 96.10.08

PN - US5751937 A 98.05.12

AB - EP-654736 A

The system includes the facility to expand disc storage by one unit at a time. The system has a host processor (1001) connected to an array of discs (1021-1024) via a controller (1010). Data is spread across the discs according to the RAID level and the number of discs available such that data can be reconstructed if one block is lost.

When a new disc unit (1025) is added, the controller begins a re-organising program. This reads data in the old pattern and rewrites

it

in the new pattern. The boundary of the change is tracked to allow host requests to be handled.

USE/ADVANTAGE - As external storage for computer system. Improved data transfer speed, increased storage capacity or increase capacity can be performed dynamically without stop of system. (Dwg.1/6)